

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Barber et al.
Serial No: 09/ 411,936
Filing Date: 4 October 1999
Title: Imaging Module for Optical
Reader

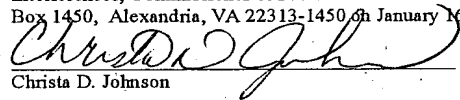
Group Art Unit: 2876

Examiner: Karl D. Frech

RESPONSE

Attention: Board of Patent Appeals and Interferences
Commissioner of Patents and Trademarks
PO Box 1450
Alexandria, VA 22313-1450

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Christa D. Johnson

AMENDED BRIEF ON APPEAL

Sir:

This amended Brief supports the appeal to the Board of Patent Appeals and Interferences from the final rejection dated 9 April 2003, in the application listed above. Applicants filed the Notice of Appeal on 3 July 2003, and submitted a Brief in triplicate, as required by 37 C.F.R. § 1.192(a) on September 3, 2003. Applicants received a Notification of Non-Compliance dated December 16, 2003 and submit this Amended Brief in triplicate in response.

I. REAL PARTY IN INTEREST

Hand Held Products, Inc., as assignee of U.S. Patent Application No.
09/411,936, is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

With respect to the appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal, there are no such appeals or interferences.

III. STATUS OF CLAIMS

Claims 1, 3-19 and 39-82 were rejected in the final Office Action dated 9 April 2003. Those are the pending claims that are the subject of this Appeal and are set forth in the attached Appendix.

IV. STATUS OF AMENDMENTS

No Amendment after Final Rejection was filed.

V. SUMMARY OF INVENTION**A. Brief Description of the Invention**

Appellant's invention is directed to optical reading devices. (Specification, page 1, line 2).

One embodiment of the present invention is directed to an imaging module that includes a circuit board (Specification, page 7, line 7) and an image sensor (Specification, page 7, line 28) carried by said circuit board. The imaging module further includes at least one light source (Specification, page 8, lines 1-2) for illuminating at least part of a target area, wherein said at least one light source is mounted to said circuit board (Specification, page 8, lines 1-2), whereby said circuit board carries both of said image sensor and said at least one light source.

Another embodiment of the present invention is directed to an optical reader for reading indicia. The optical reader includes a housing (Specification, page 19, lines 20-22) and an imaging module (Specification, page 19, lines 19-20) disposed in the housing. The imaging module includes a circuit board (Specification, page 7, line 7), an image sensor carried by the circuit board (Specification, page 7, line 28); and at least one light source for illuminating at least part of a target area outside of the housing (Specification, page 8, lines 1-2). The at least one light source is mounted to

the circuit board, whereby the circuit board carries both of the image sensor and the at least one light source (Specification, page 8, lines 1-2).

Another embodiment of the present invention is directed to an imaging module (Specification, page 6, line 25) including a frame having sidewalls (specification, page 7, lines 13-14). The imaging module further includes a circuit board (Specification, page 7, line 7) mounted to the frame and an image sensor (Specification, page 7, line 28) carried by the circuit board. The imaging module also includes at least one light source for illuminating at least part of a target area, a planar optical member (Specification, page 9, line 30) carrying at least one optical component; and resilient fingers formed in the sidewalls for receiving and securing the planar optical member in a stationary position in the frame (Specification, page 10, lines 5-6).

Another embodiment of the present invention is directed to an imaging module including a one-piece frame (Specification, page 7, line 4) including a lens assembly retainer section and top and side sidewalls delimiting an area. The imaging module further includes a circuit board (Specification, page 7, line 7), an imaging assembly (Specification, page 7, line 28), including a sensor carried by the circuit board, and a lens assembly (Specification, page 7, lines 20-21) disposed in the retainer section and at least one light source for illuminating at least part of a target area.

Another embodiment of the present invention is directed to an imaging module including a circuit board (Specification, page 7, line 7), an image sensor (Specification, page 7, line 28), an aiming light source (Specification, page 9, line 9) for projecting at least part of an aiming pattern on a target area (Specification, page 9, lines 12-14), and an opaque dome disposed over the aiming light source, the opaque dome having an aperture (Specification, page 9, lines 5-10).

B. Problems in the Prior Art

Conventional optical readers require illumination elements, electronic signal processing circuits and/or processors, image sensors, image capture circuitry, and image decoding circuitry. Typically, each of these elements is a separate component

that is assembled into the optical reader by coupling the component to an electronic motherboard. An example of such a conventional optical reader is disclosed in U.S. Patent No. 5,780,834 to Havens et al..

The assembly of the separate components, each having its own printed circuit board, into an optical reader is a time consuming and expensive process. The assembly process requires that each individual component printed circuit board be mounted to a separate internal structure of the optical reader and requires the completion of numerous electrical connections to produce a working optical reader. Additionally, as separate components, each element possesses a certain minimum size because of limitations on handling and future assembly. The minimum size requirements of the separate components further impose requirements on the size of the housing of the optical reader into which the separate components will be assembled.

C. Detailed Description of the Invention

The present invention relates to optical reading devices particularly useful in the packaging of the elements of an optical reader into a single unit. As noted above, conventional optical readers are assembled from separate functional components residing on individual printed circuit boards. The present invention synergistically combines all of the elements of an optical indicia reader into a single module.

The present invention includes an imaging module (10) specifically configured for use as an indicia reader (page 6, lines 26-27). The imaging module (10) includes a mounting frame (12) adapted to receive both optical and electrical components (page 7, lines 4-6). The mounting frame (12) receives a printed circuit board (14), illumination light emitting diodes (16), aiming light emitting diodes (18), an aiming lens aperture plate (24) and a diffuser plate (26) (page 7, lines 7-9).

The frame includes a back plate (30) and sidewalls (31, 31') (page 7, lines 13-15). The back plate (30) includes a recess (34) for receiving an image sensor (32) (page 7, lines 15-16). The back plate (30) may also include a retainer (40) for a receive optics lens assembly (41) (page 7, lines 19-21). The printed circuit board (14) is coupled to the mounting frame (12) (page 7, lines 25-26). The illumination

light emitting diodes (16), the aiming light emitting diodes (18) and the image sensor (32) are mounted to the printed circuit board (14) (page 7, lines 28-29 and page 8, lines 3-6).

The aperture plate (24) is installed in the mounting frame (12) such that the domes (42) of the aperture plate (24) fit over the aiming light emitting diodes (18) (page 9, lines 5-7). The domes (42) include slit apertures (43) that allow a predetermined amount of light to pass through the aperture plate (24) (page 9, lines 6-10). The slit apertures (43) are formed to generate a desired aiming pattern, such as, for example a horizontal line (page 9, lines 10-12). The aperture plate (24) includes cutaway sections (46) that allow the aperture plate (24) to fit over the illumination light emitting diodes (16) (Page 9, lines 16-18).

The diffuser plate (26) fits into the mounting frame (12) and is coupled thereto (page 9, line 30 - page 10, line 1). The diffuser plate (26) diffuses light from the illumination light emitting diodes (16) in order to provide substantially homogeneous illumination of the target (page 10, lines 1-4). The coupling of the diffuser plate (26) to the mounting frame (12) clamps the aperture plate (24) between the diffuser plate (26) and the mounting frame (12) thereby holding the aperture plate (24) in the desired position (page 10, lines 14-19).

Essentially all of the electronic circuitry supporting the data processing operations may be incorporated into the single printed circuit board (14) (page 11, line 29 - page 12, line 1). The electronic circuitry for the data processing operations include circuitry for processing signals generated by the image sensor (32) and circuitry for capturing image data into a memory device, circuitry for decoding/recognizing indicia in captured image data (page 11, lines 1-5).

Providing a single printed circuit board that carries all the image sensor, and the illumination and aiming light emitting diodes significantly simplifies assembly and reduces material consumption, thereby reducing the overall cost of producing the imaging module.

VI. ISSUES

Issues presented for consideration in this Appeal are:

- A. Whether claims 1, 3-19 and 39-82 are patentable under 35 U.S.C. § 103 as being nonobvious over U.S. Patent No. to O'Hagan et al. when the applied reference does not show every recited limitation of the rejected claims.

VII. GROUPING OF CLAIMS

In compliance with 37 C.F.R. § 1.192(c)(5), Applicants state that all of the claims do not stand or fall together. All claims are considered separately patentable, and the particular reasons supporting the patentability of each of the claims appear in the Argument section below.

VIII. ARGUMENTS

A. Description of the Art Cited by the Examiner

In the final Office Action of 9 April 2003, the Examiner rejected pending claims 1, 3-19 and 39-82 under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 5,821,513 to

O'Hagan et al. ("the O'Hagan '513 patent"). On pages 2-3 of the final Office Action, the Examiner stated that:

O'Hagan discloses in figure 4, as described in column 6, line 20 - column 7, line 27, a scanning mechanism including a two dimensional photo sensing array 170 mounted on a circuit board 146. Also disclosed are illumination means 44 including LED's 180, targeting LED's 188, 186 mounted on circuit board 146 which project targeting beams through an aperture in board 189. There is disclosed an image processor 120 mounted on the circuit board. As seen in the figure, the entire circuit board apparatus is enclosed and mounted within a housing including back and side walls 162.

The O'Hagan '513 patent is directed to a data information display system. The disclosure of the O'Hagan '513 patent that is closest in relevance to the present application is found in figure 4 and at column 6, line 20 to column 7, line 27 of the O'Hagan '513 patent.

The O'Hagan '513 patent discloses a plurality of printed circuit boards 174, 176, 146 that are conventionally available. (Column 6, lines 63). The multiple circuit boards 146, 174, 176 operate to "generate an analog composite signal, store a digital representation of a captured image, and decode the captured image to generate the decoded data signal." (Column 6, line 65 to column 7, line 1). Thus, O'Hagan teaches the use of multiple circuit boards to provide the required data processing functions. Furthermore, the O'Hagan '513 patent discloses a device in which the image sensor is carried by a first circuit board and the illumination light sources are carried by a second separate circuit board. The O'Hagan '513 patent further teaches that the aiming light sources are not directly mounted to a printed circuit board, instead the aiming light sources of the O'Hagan '513 patent are carried by LED holders.

B. O'Hagan Does Not Teach or Disclose the Claimed Invention

In withdrawing the rejection of the pending claims under 35 U.S.C. §102 made in Paper 9, the Examiner has admitted that the one reference cited by the Examiner, the O'Hagan '513 patent, is not anticipatory of the claimed invention. Thus, the O'Hagan '513 patent fails to teach each and every limitation of the claimed invention. The Examiner has attempted to cure the deficiencies of the cited reference by rejecting the pending claims over the O'Hagan '513 patent "in view of well known prior art." In making this rejection the Examiner offers only cursory and conclusory statements in support of the rejection of all of the pending claims of the instant application.

Claim 1

The Examiner's rejection of claim 1 under 35 U.S.C. §103(a) as being unpatentable over O'Hagan et al., in view of well known prior art should be withdrawn as the Examiner has failed to establish a prima facie case of obviousness.

Claim 1 of the present application recites an imaging module comprising: a circuit board; an image sensor carried by said circuit board; and at least one light source for illuminating at least part of a target area, wherein said at least one light source is

mounted to said circuit board, whereby said circuit board carries both of said image sensor and said at least one light source.

The Examiner asserts

"O'Hagan discloses in figure 4 as described in column 6 line 20 - column 7 line 27, a scanning mechanism including a two dimensional photo sensing array 170 mounted on a circuit board 146. Also disclosed are illumination means 44 including LED's 180, targeting LED's 188, 186 mounted on circuit board 146 which project targeting beams through an aperture in board 189. There is disclosed an image processor 120 mounted on the circuit board. As seen in the figure, the entire circuit board apparatus is enclosed and mounted within a housing including back and side-walls 162. (Paper 15, numbered paragraph 3).

The Examiner admits that O'Hagan teaches that the elements are mounted on separate circuit boards. (Paper 15, numbered paragraph 3).

The Examiner further asserts that "it would have been obvious to a person of ordinary skill in the art at the time the invention was made to mount all the elements of O'Hagan on a single circuit board in order to accommodate for alternate packaging and housing details dictated by the environment in which the apparatus is to be used." (Paper 15, numbered paragraph 3). The Examiner attempts to support this conclusory statement by reasoning that the "rearrangement of parts, mounting multiple elements on a single circuit board is old and well known." (Paper 15, numbered paragraph 3).

Applicants respectfully submit that the Examiner failed to provide a *prima facie* case of obviousness because one of ordinary skill in the art would not be motivated to use or modify the teaching of the O'Hagan '513 patent to obtain Applicants' invention. In re Vaeck, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991).

"The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." In re Fritch, 23 U.S.P.Q.2d 1780, 1783-84 (Fed. Cir. 1992). The Examiner did not, and is unable, to point to any place in the O'Hagan '513 patent where it suggests or provides a motive to modify the O'Hagan '513 patent

structures to obtain an imaging module in the manner claimed by the Applicants. Instead of citing support, The Examiner merely asserts in a conclusory manner that "it would have been obvious to a person of ordinary skill in the art at the time the invention was made to mount all of the elements of O'Hagan on a single circuit board in order to accommodate for alternate packaging or housing details dictated by the environment in which the apparatus is to be used." (Paper 15, numbered paragraph 3). The Examiner apparently agrees that the O'Hagan '513 patent does not suggest or provides a motive to modify the O'Hagan '513 patent structures to obtain an imaging module in the manner claimed by the Applicants, as the Examiner asserts the "mounting multiple elements on a single circuit board is old and well known." (Paper 15, numbered paragraph 3).

Applicants respectfully submit that in making this assertion the Examiner, the Examiner has impermissibly generalized the claimed invention and has failed to provide any substantial support for this conclusory remark.

Applicants respectfully submit that the Examiner has with twenty-twenty hindsight merely restated one of the objects and the advantages of Applicants' claimed invention, and in particular those advantages of one of Applicants' preferred embodiments. Applicants state at page 4, lines 6-12, that "[a] major feature of the invention is the incorporation of essentially all of the illumination elements required of an optical reader, including illumination and aiming light sources, and an image sensor onto a single circuit board." In accordance with this object, Applicants invented an imaging module that includes a circuit board, an image sensor and an illumination light source mounted to the circuit board.

Having suggested that this limitation is well known to the art, it is incumbent upon the Examiner to submit an affidavit or citation to art to set forth a *prima facie* case of obviousness. M.P.E.P. § 706.02(a). The Examiner has failed to do either. For at least this reason, the Examiner has failed to establish a *prima facie* case of obviousness.

Claims 3-19, 58-61, and 75-78

Claims 3-19, 58-61 and 75-78 are believed to be allowable for at least the reason that they depend from an allowable base claim. Furthermore, Applicants submit that claims 3-19, 58-61 and 75-78 are allowable for reasons in addition to their dependency from an allowable base claim. The additional reasons for the allowability of claims 3-19, 58-61 and 75-78 will now be discussed.

Claim 3 depends from claim 1 and recites the further limitations of an aiming light source and an illumination light source mounted to the circuit board, whereby the circuit board carries the image sensor, the illumination light source and the aiming light source. The O'Hagan '513 patent, which is the only reference relied upon by the Examiner, explicitly teaches that the image sensor and the light sources are **not** mounted on a single circuit board. Instead, the O'Hagan '513 patent teaches that these components are mounted to separate circuit boards that are then interconnected to form an optical reader and that the light sources are mounted in LED holders that are in turn mounted to a separate circuit board. As previously pointed out, the O'Hagan '513 patent does not teach mounting an image sensor and an illumination light source on a common circuit board. Furthermore, the O'Hagan '513 patent neither teaches nor suggest mounting an image sensor, an illumination light source and an aiming light source on the same circuit board. Thus, the one reference cited by the Examiner does not teach each and every limitation of the claimed invention, nor does it provide a motivation for modifying its teachings to arrive at the claimed invention. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 4 depends from claim 1 and recites the further limitation of a frame and at least one planar optical component. The claim further recites that the frame comprises sidewalls having resilient fingers formed therein for receiving and securing the optical component in the frame in a stationary position in the frame without use of adhesives or any additional mechanical securing apparatuses or agents. The O'Hagan '513 patent does not disclose an a planar optical component that is coupled to a frame using only resilient fingers. The Examiner admits that the O'Hagan '513 patent "does not disclose the specific housing details as claimed or the 'finger' mounting as

claimed.” Therefore, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 5 depends from claim 1 and recites the further limitation that the circuit board carries essentially all image sensor signal processing circuitry, image capture circuitry, and decoding and or recognizing circuitry of an optical reader in which said module is to be installed. This limitation is not disclosed or suggested by the O’Hagan ‘513 patent. To the contrary, the O’Hagan ‘513 patent teaches that the image sensor and image processing circuitry are mounted on *separate* circuit boards. The Examiner again has failed to establish a prima facie case of obviousness with respect to claim 5. The O’Hagan ‘513 patent provides no motivation for modifying its teachings to the apparatus of the claimed invention. The Examiner seeks to provide this motivation by asserting “mounting multiple elements on a single circuit board is old and well known.” (Paper 15, numbered paragraph 3). Applicants respectfully submit that this is a unsupported generalization improperly applied to the claimed invention and that in making this assertion the Examiner fails to consider the specific elements Applicants have located on a common circuit board. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 6 depends from claim 1 and recites the additional limitations that the image sensor is a 2D image sensor, that the at least one light source is a plurality of aiming light sources, and that the module includes optics associated with the plurality of aiming light sources for projecting a solitary horizontal line aiming pattern in a target area. At least one of these additional limitations, namely the optics for projecting solitary horizontal aiming pattern is neither disclosed nor suggest by the O’Hagan ‘513 patent. In fact, the O’Hagan ‘513 patent teaches a cross hair aiming pattern (figure 2 and column 5 line 42). Furthermore, neither the O’Hagan ‘513 pattern or the Examiner provide a motivation for modifying the cross hair illumination pattern of the O’Hagan ‘513 patent. Thus, claim 6 is at least allowable for the additional reason that at least one of its recited limitations is not found in the art cited by the Examiner, nor has the Examiner pointed out a motivation to modify the cited art to arrive at that claimed invention.

Claim 7 depends from claim 1 and recites the additional limitation of a one-piece frame that defines top, bottom and side sidewalls of the imaging module. The O'Hagan '513 patent does not disclose or suggest a one piece frame assembly. Nor does the Examiner assert that the recited limitation of the one-piece frame is well known prior art, rather the Examiner admits the O'Hagan '513 patent "does not disclose the specific housing details as claimed." (Paper 15, numbered paragraph 3). Thus, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 8 depends from claim 7 and recites the further limitation that the imaging module further comprises a lens assembly and wherein the frame is a one-piece unit further comprising a retainer section retaining the lens assembly. The O'Hagan '513 patent does not disclose or suggest a one piece frame assembly including a retainer section. Nor does the Examiner assert that the recited limitation of the one-piece frame including a retainer section is well known prior art, rather the Examiner admits the O'Hagan '513 patent "does not disclose the specific housing details as claimed." (Paper 15, numbered paragraph 3). Thus, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 9 depends from claim 7 and recites the further limitation that the top and side sidewalls of the one-piece frame define a partially enclosed contained area and that the at least one light source and the image sensor are disposed inside the contained area, whereby the at least one light source and the image sensor are structurally protected by the frame. The O'Hagan '513 patent does not disclose or suggest an image module having a one piece frame assembly defining a partially enclosed area where the image sensor and the light source are structurally protected by being disposed with the partially enclosed area. In fact, the Examiner admits the O'Hagan '513 patent "does not disclose the specific housing details as claimed." (Paper 15, numbered paragraph 3). Thus, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 10 depends from claim 1 and further recites the limitation that the image module include a frame, wherein the frame includes top and side sidewalls and the combination of the circuit board and the top and side sidewalls defines a partially

enclosed contained area and *delimits an exterior of the module*. Claim 10 recites the further limitation that the at least one light source is disposed inside the contained area and is structurally protected by a combination of the circuit board and the frame. The O'Hagan '513 patent neither teaches nor discloses an image module in which a circuit board delimits an exterior of the module, conversely, the O'Hagan '513 patent teaches that its plethora of circuit boards are contained within a housing. Furthermore, the O'Hagan '513 patent teaches that the housing is weather-proofed. (Column 6, line 41). Applicants respectfully submit that this teaching implicitly teaches away from claimed invention as the O'Hagan '513 patent is teaching that the electrical components of the image module require encapsulation. For at least this reason the Examiner has failed to establish a prima facie case of obviousness.

Claim 11 depends from claim 1 and further recites the limitation that the image module include a frame, wherein the frame includes top and side sidewalls and the combination of the circuit board and the top and side sidewalls defines a partially enclosed contained area and *delimits an exterior of said module*. Claim 11 recites the further limitation that the at least one light source and the image sensor are disposed inside the contained area and are structurally protected by the combination of the circuit board and the frame. The O'Hagan '513 patent neither teaches nor discloses an image module in which a circuit board delimits an exterior of the module, conversely, the O'Hagan '513 patent teaches that its plethora of circuit boards are contained within a housing. Furthermore, the O'Hagan '513 patent teaches that the housing is weather-proofed. (Column 6, line 41). Applicants respectfully submit that this teaching implicitly teaches away from claimed invention as the O'Hagan '513 patent is teaching that the electrical components of the image module require encapsulation. For at least this reason the Examiner has failed to establish a prima facie case of obviousness.

Claim 12 depends from claim 10 and recites the further limitation that essentially an entirety of light sources of the module are incorporated in the contained area.

Claim 13 depends from claim 1 and recites the further limitation that the image module include a frame having a back plate with a center recess for receiving

and aligning the image sensor. The O'Hagan '513 patent does not disclose a frame having a back plate that includes a center recess for receiving and aligning the image sensor. The Examiner asserts that "[m]ounting 'fingers' are old and well known, as are 'recesses' and alignment means in electronic equipment enclosing circuit boards." (Paper No. 15, number paragraph 3). The Examiner further asserts that "[i]t would have been obvious to a person of ordinary skill in the art at the time the invention was made to mount the board of O'Hagan using mounting 'fingers' and to provide 'recesses' for alignment in the housing of O'Hagan." (Paper No. 15, number paragraph 3). In making this rejection, the Examiner appears to be equating the exterior cover of the O'Hagan '513 patent with the frame of the claimed invention. However, the O'Hagan '513 patent discloses a weather proof housing encapsulating all of the electronic components of the device. The frame of the claimed invention is not so limited. Furthermore, the O'Hagan '513 patent does not disclose recesses for positioning the image sensor in a predetermined position with respect to the housing, at best the O'Hagan '513 patent discloses an opening through which the image sensor optics extend, however, there is no teaching that this opening is used for aligning the image sensor. Nor does the O'Hagan '513 patent provide a motivation for using recesses for alignment of the image sensor.

Applicants respectfully submit that the Examiner has with twenty-twenty hindsight merely restated one of the objects and the advantages of Applicants' claimed invention, and in particular those advantages of one of Applicants' preferred embodiments.

Claim 14 depends from claim 1 and recites the limitations that the image module further includes a frame with a back plate having a center recess for receiving and aligning the image sensor and at least one side recess for accommodating electrical components emanating forwardly of said circuit board. The O'Hagan '513 patent does not disclose a frame having a back plate that includes a center recess for receiving and aligning the image sensor. The Examiner asserts that "[m]ounting 'fingers' are old and well known, as are 'recesses' and alignment means in electronic equipment enclosing circuit boards." (Paper No. 15, number paragraph 3). The Examiner further asserts that "[i]t would have been obvious to a person of ordinary skill in the art at the time the invention was made to mount the board of O'Hagan

using mounting "fingers" and to provide "recesses" for alignment in the housing of O'Hagan." (Paper No. 15, number paragraph 3). In making this rejection, the Examiner appears to be equating the exterior cover of the O'Hagan '513 patent with the frame of the claimed invention. However, the O'Hagan '513 patent discloses a weather proof housing encapsulating all of the electronic components of the device. The frame of the claimed invention is not so limited. Furthermore, the O'Hagan '513 patent does not disclose recesses for positioning the image sensor in a predetermined position with respect to the housing, at best the O'Hagan '513 patent discloses an opening through which the image sensor optics extend, however, there is no teaching that this opening is used for aligning the image sensor. Nor does the O'Hagan '513 patent provide a motivation for using recesses for alignment of the image sensor or for providing recesses for electrical components on the circuit board.

Applicants respectfully submit that the Examiner has with twenty-twenty hindsight merely restated one of the objects and the advantages of Applicants' claimed invention, and in particular those advantages of one of Applicants' preferred embodiments.

Claim 15 depends from claim 1 and recites the further limitation that the image module includes an aperture plate having a pair of apertured domes disposed over the light sources for shaping light emanating from the aiming light sources. The O'Hagan '513 patent does not disclose a apertured domes for generating an aiming pattern as recited by claim 15. Applicants submit that the O'Hagan '513 patent discloses a cross hair aiming pattern, however, there is no teaching as to how that aiming pattern is generated. Applicants submit that, the Examiner has provided no evidence to support a prima facie case of obviousness.

Claim 16 depends from claim 1 and recites the limitation that the image module includes a frame having a back plate having the leads of an aiming light emitting diode extending there through. The O'Hagan '513 patent discloses no such feature. Thus, the

one reference cited by the Examiner does not teach or suggest the recited limitation of the rejected claim.

Claim 17 depends from claim 1 and recites the additional limitations of an aperture plate and a diffuser plate. The O'Hagan '513 patent does not disclose a apertured domes for generating an aiming pattern. Applicants submit that the O'Hagan '513 patent discloses a cross hair aiming pattern, however, there is no teaching as to how that aiming pattern is generated. Furthermore, the O'Hagan '513 patent does not disclose or suggest a diffuser of any kind. Thus, the one reference cited by the Examiner does not teach or suggest the recited limitation of the rejected claim. Therefore, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 18 depends from claim 17 and recites the further limitation that the image module further includes means adapting said diffuser plate to be snap-fit onto the frame. As noted above, the O'Hagan '513 patent does not teach or suggest a diffuser plate, nor has the Examiner used official notice to provide prior art including the recited limitations of claim 18. Therefore, for at least these reasons, the Examiner has failed to establish a case of prima facie obviousness.

Claim 19 depends from claim 17 and recites the further limitation that the image module further includes means adapting said diffuser plate to be snap-fit onto the frame. Claim 18 recites the further limitation of means adapting the aperture plate to be biased towards the back plate when the diffuser plate is snap-fit onto the frame. As noted above, the O'Hagan '513 patent does not teach or suggest a diffuser plate, nor has the Examiner used official notice to provide prior art including the recited limitations of claim 18. Therefore, for at least these reasons, the Examiner has failed to establish a case of prima facie obviousness.

Claim 39

Claim 39 of the present application recites an optical reader comprising: a housing and a imaging module, the imaging module including: a circuit board; an image sensor carried by the circuit board; and at least one light source for illuminating

at least part of a target area, wherein the at least one light source is mounted to the circuit board, whereby the circuit board carries both of said image sensor and said at least one light source.

The Examiner's rejection of claim 39 under 35 U.S.C. §103(a) as being unpatentable over O'Hagan et al., in view of well known prior art should be withdrawn as the Examiner has failed to establish a *prima facie* case of obviousness.

The Examiner asserts

"O'Hagan discloses in figure 4 as described in column 6 line 20 - column 7 line 27, a scanning mechanism including a two dimensional photo sensing array 170 mounted on a circuit board 146. Also disclosed are illumination means 44 including LED's 180, targeting LED's 188, 186 mounted on circuit board 146 which project targeting beams through an aperture in board 189. There is disclosed an image processor 120 mounted on the circuit board. As seen in the figure, the entire circuit board apparatus is enclosed and mounted within a housing including back and side-walls 162. (Paper 15, numbered paragraph 3).

The Examiner admits that O'Hagan teaches that the elements are mounted on separate circuit boards. (Paper 15, numbered paragraph 3).

The Examiner further asserts that "it would have been obvious to a person of ordinary skill in the art at the time the invention was made to mount all the elements of O'Hagan on a single circuit board in order to accommodate for alternate packaging and housing details dictated by the environment in which the apparatus is to be used." (Paper 15, numbered paragraph 3). The Examiner attempts to support this conclusory statement by reasoning that the "rearrangement of parts, mounting multiple elements on a single circuit board is old and well known." (Paper 15, numbered paragraph 3).

Applicants respectfully submit that the Examiner failed to provide a *prima facie* case of obviousness because one of ordinary skill in the art would not be motivated to use or modify the teaching of the O'Hagan '513 patent to obtain Applicants' invention. In re Vaeck, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991).

"The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." In re Fritch, 23 U.S.P.Q.2d 1780, 1783-84 (Fed. Cir. 1992). The Examiner did not, and is unable, to point to any place in the O'Hagan '513 patent where it suggests or provides a motive to modify the O'Hagan '513 patent structures to obtain an imaging module in the manner claimed by the Applicants. Instead of citing support, The Examiner merely asserts in a conclusory manner that "it would have been obvious to a person of ordinary skill in the art at the time the invention was made to mount all of the elements of O'Hagan on a single circuit board in order to accommodate for alternate packaging or housing details dictated by the environment in which the apparatus is to be used." (Paper 15, numbered paragraph 3). The Examiner apparently agrees that the O'Hagan '513 patent does not suggest or provides a motive to modify the O'Hagan '513 patent structures to obtain an imaging module in the manner claimed by the Applicants, as the Examiner asserts the "mounting multiple elements on a single circuit board is old and well known." (Paper 15, numbered paragraph 3). Applicants respectfully submit that in making this assertion the Examiner, the Examiner has impermissibly generalized the claimed invention and has failed to provide any substantial support for this conclusory remark.

Applicants respectfully submit that the Examiner has with twenty-twenty hindsight merely restated one of the objects and the advantages of Applicants' claimed invention, and in particular those advantages of one of Applicants' preferred embodiments. Applicants state at page 4, lines 6-12, that "[a] major feature of the invention is the incorporation of essentially all of the illumination elements required of an optical reader, including illumination and aiming light sources, and an image sensor onto a single circuit board." In accordance with this object, Applicants invented an imaging module that includes a circuit board, an image sensor and an illumination light source mounted to the circuit board. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claims 41-57, 62-64 and 79-82

Claims 41-57, 62-64 and 79-82 are believed to be allowable for at least the reason that they depend from an allowable base claim. Furthermore, Applicants submit that claims 40-57, 62-64 and 79-82 are allowable for reasons in addition to

their dependency from an allowable base claim. The additional reasons for the allowability of claims 41-57, 62-64 and 79-82 will now be discussed.

Claim 41 depends from claim 39 and recites the further limitations of an aiming light source and an illumination light source mounted to the circuit board, whereby the circuit board carries the image sensor, the illumination light source and the aiming light source. The O'Hagan '513 patent, which is the only reference relied upon by the Examiner, explicitly teaches that the image sensor and the light sources are **not** mounted on a single circuit board. Instead, the O'Hagan '513 patent teaches that these components are mounted to separate circuit boards that are then interconnected to form an optical reader and that the light sources are mounted in LED holders that are in turn mounted to a separate circuit board. As previously pointed out, the O'Hagan '513 patent does not teach mounting an image sensor mounting and an illumination light source on a common circuit board. Furthermore, the O'Hagan '513 patent neither teaches nor suggest mounting an image sensor, an illumination light source and an aiming light source on the same circuit board. Thus, the one reference cited by the Examiner does not teach each and every limitation of the claimed invention, nor does it provide a motivation for modifying its teachings to arrive at the claimed invention. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 42 depends from claim 39 and recites the further limitation of a frame and at least one planar optical component. The claim further recites that the frame comprises sidewalls having resilient fingers formed therein for receiving and securing the optical component in the frame in a stationary position in the frame without use of adhesives or any additional mechanical securing apparatuses or agents. The O'Hagan '513 patent does not disclose an a planar optical component that is coupled to a frame using only resilient fingers. The Examiner admits that the O'Hagan '513 patent "does not disclose the specific housing details as claimed or the 'finger' mounting as claimed." Therefore, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 43 depends from claim 39 depends from claim 1 and recites the further limitation that the circuit board carries essentially all image sensor signal processing circuitry, image capture circuitry, and decoding and or recognizing circuitry of an optical reader in which said module is to be installed. This limitation is not disclosed or suggested by the O'Hagan '513 patent. To the contrary, the O'Hagan '513 patent teaches that the image sensor and image processing circuitry are mounted on *separate* circuit boards. The Examiner again has failed to establish a prima facie case of obviousness with respect to claim 5. The O'Hagan '513 patent provides no motivation for modifying its teachings to the apparatus of the claimed invention. The Examiner seeks to provide this motivation by asserting "mounting multiple elements on a single circuit board is old and well known." (Paper 15, numbered paragraph 3). Applicants respectfully submit that this is a unsupported generalization improperly applied to the claimed invention and the in making this assertion the Examiner fails to consider the specific elements Applicants have located on a common circuit board. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 44 depends from claim 39 depends from claim 1 and recites the additional limitations that the image sensor is a 2D image sensor, that the at least one light source is a plurality of aiming light sources, and that the module includes optics associated with the plurality of aiming light sources for projecting a solitary horizontal line aiming pattern in a target area. At least one of these additional limitations, namely the optics for projecting solitary horizontal aiming pattern is neither disclosed nor suggest by the O'Hagan '513 patent. In fact, the O'Hagan '513 patent teaches a cross hair aiming pattern (figure 2 and column 5 line 42). Furthermore, neither the O'Hagan '513 pattern or the Examiner provide a motivation for modifying the cross hair illumination pattern of the O'Hagan '513 patent. Thus, claim 44 is at least allowable for the additional reason that at least one of its recited limitations is not found in the art cited by the Examiner, nor has the Examiner pointed out a motivation to modify the cited art to arrive at that claimed invention. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 45 depends from claim 39 and recites the additional limitation of a one-piece frame that defines top, bottom and side sidewalls of the imaging module. The O'Hagan '513 patent does not disclose or suggest a one piece frame assembly. Nor does the Examiner assert that the recited limitation of the one-piece frame is well known prior art, rather the Examiner admits the O'Hagan '513 patent "does not disclose the specific housing details as claimed." (Paper 15, numbered paragraph 3). Thus, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness with regard to claim 7.

Claim 46 depends from claim 45 and recites the further limitation that the imaging module further comprises a lens assembly and wherein the frame is a one-piece unit further comprising a retainer section retaining the lens assembly. The O'Hagan '513 patent does not disclose or suggest a one piece frame assembly including a retainer section. Nor does the Examiner assert that the recited limitation of the one-piece frame including a retainer section is well known prior art, rather the Examiner admits the O'Hagan '513 patent "does not disclose the specific housing details as claimed." (Paper 15, numbered paragraph 3). Thus, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 47 depends from claim 45 and recites the further limitation that the top and side sidewalls of the one-piece frame define a partially enclosed contained area and that the at least one light source and the image sensor are disposed inside the contained area, whereby the at least one light source and the image sensor are structurally protected by the frame. The O'Hagan '513 patent does not disclose or suggest an image module having a one piece frame assembly defining a partially enclosed area where the image sensor and the light source are structurally protected by being disposed with the partially enclosed area. In fact, the Examiner admits the O'Hagan '513 patent "does not disclose the specific housing details as claimed." (Paper 15, numbered paragraph 3). Thus, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 48 depends from claim 39 and further recites the limitation that the image module include a frame, wherein the frame includes top and side sidewalls and

the combination of the circuit board and the top and side sidewalls defines a partially enclosed contained area and *delimits an exterior of the module*. Claim 10 recites the further limitation that the at least one light source is disposed inside the contained area and is structurally protected by a combination of the circuit board and the frame. The O'Hagan '513 patent neither teaches nor discloses an image module in which a circuit board delimits an exterior of the module, conversely, the O'Hagan '513 patent teaches that its plethora of circuit boards are contained within a housing. Furthermore, the O'Hagan '513 patent teaches that the housing is weather-proofed. (Column 6, line 41). Applicants respectfully submit that this teaching implicitly teaches away from claimed invention as the O'Hagan '513 patent is teaching that the electrical components of the image module require encapsulation. For at least this reason the Examiner has failed to establish a prima facie case of obviousness. Applicants submit therefore that the rejection of claim 48 is improper and request that it be withdrawn.

Claim 49 depends from claim 39 and further recites the limitation that the image module include a frame, wherein the frame includes top and side sidewalls and the combination of the circuit board and the top and side sidewalls defines a partially enclosed contained area and *delimits an exterior of said module*. Claim 49 recites the further limitation that the at least one light source and the image sensor are disposed inside the contained area and are structurally protected by the combination of the circuit board and the frame. The O'Hagan '513 patent neither teaches nor discloses an image module in which a circuit board delimits an exterior of the module, conversely, the O'Hagan '513 patent teaches that its plethora of circuit boards are contained within a housing. Furthermore, the O'Hagan '513 patent teaches that the housing is weather-proofed. (Column 6, line 41). Applicants respectfully submit that this teaching implicitly teaches away from claimed invention as the O'Hagan '513 patent is teaching that the electrical components of the image module require encapsulation. For at least this reason the Examiner has failed to establish a prima facie case of obviousness. Applicants submit therefore that the rejection of claim 49 is improper and request that it be withdrawn.

Claim 50 depends from claim 48 and recites the additional limitation that essentially an entirety of the illumination sources of the module are incorporated in

the contained area. The O'Hagan '513 patent does not teach or suggest placing the illumination light sources in a frame. Nor does the Examiner provide any support as to why a skilled artisan would be motivated to modify the teachings of the O'Hagan '513 patent to arrive at the claimed invention. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 51 depends from claim 39 and recites the further limitation that the image module include a frame having a back plate with a center recess for receiving and aligning the image sensor. The O'Hagan '513 patent does not disclose a frame having a back plate that includes a center recess for receiving and aligning the image sensor. The Examiner asserts that "[m]ounting 'fingers' are old and well known, as are 'recesses' and alignment means in electronic equipment enclosing circuit boards." (Paper No. 15, number paragraph 3). The Examiner further asserts that "[i]t would have been obvious to a person of ordinary skill in the art at the time the invention was made to mount the board of O'Hagan using mounting 'fingers' and to provide 'recesses' for alignment in the housing of O'Hagan." (Paper No. 15, number paragraph 3). In making this rejection, the Examiner appears to be equating the exterior cover of the O'Hagan '513 patent with the frame of the claimed invention. However, the O'Hagan '513 patent discloses a weather proof housing encapsulating all of the electronic components of the device. The frame of the claimed invention is not so limited. Furthermore, the O'Hagan '513 patent does not disclose recesses for positioning the image sensor in a predetermined position with respect to the housing, at best the O'Hagan '513 patent discloses an opening through which the image sensor optics extend, however, there is no teaching that this opening is used for aligning the image sensor. Nor does the O'Hagan '513 patent provide a motivation for using recesses for alignment of the image sensor.

Applicants respectfully submit that the Examiner has with twenty-twenty hindsight merely restated one of the objects and the advantages of Applicants' claimed invention, and in particular those advantages of one of Applicants' preferred embodiments.

Claim 52 depends from claim 39 and recites the limitations that the image module further includes a frame with a back plate having a center recess for receiving and aligning the image sensor and at least one side recess for accommodating electrical components emanating forwardly of said circuit board. The O'Hagan '513 patent does not disclose a frame having a back plate that includes a center recess for receiving and aligning the image sensor. The Examiner asserts that "[m]ounting 'fingers' are old and well known, as are 'recesses' and alignment means in electronic equipment enclosing circuit boards." (Paper No. 15, number paragraph 3). The Examiner further asserts that "[i]t would have been obvious to a person of ordinary skill in the art at the time the invention was made to mount the board of O'Hagan using mounting 'fingers' and to provide 'recesses' for alignment in the housing of O'Hagan." (Paper No. 15, number paragraph 3). In making this rejection, the Examiner appears to be equating the exterior cover of the O'Hagan '513 patent with the frame of the claimed invention. However, the O'Hagan '513 patent discloses a weather proof housing encapsulating all of the electronic components of the device. The frame of the claimed invention is not so limited. Furthermore, the O'Hagan '513 patent does not disclose recesses for positioning the image sensor in a predetermined position with respect to the housing, at best the O'Hagan '513 patent discloses an opening through which the image sensor optics extend, however, there is no teaching that this opening is used for aligning the image sensor. Nor does the O'Hagan '513 patent provide a motivation for using recesses for alignment of the image sensor or for providing recesses for electrical components on the circuit board.

Applicants respectfully submit that the Examiner has with twenty-twenty hindsight merely restated one of the objects and the advantages of Applicants' claimed invention, and in particular those advantages of one of Applicants' preferred embodiments. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 53 depends from claim 39 and recites the further limitation that the image module includes an aperture plate having a pair of apertured domes disposed over the light sources for shaping light emanating from the aiming light sources. The O'Hagan '513 patent does not disclose a apertured domes for generating an aiming

pattern as recited by claim 15. Applicants submit that the O'Hagan '513 patent discloses a cross hair aiming pattern, however, there is no teaching as to how that aiming pattern is generated. Applicants submit that, the Examiner has provided no evidence to support a prima facie case of obviousness. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 54 depends from claim 39 and recites the limitation that the image module includes a frame having a back plate having the leads of an aiming light emitting diode extending there through. The O'Hagan '513 patent discloses no such feature. Thus, the one reference cited by the Examiner does not teach or suggest the recited limitation of the rejected claim. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 55 depends from claim 39 and recites the additional limitations of an aperture plate and a diffuser plate. The O'Hagan '513 patent does not disclose a apertured domes for generating an aiming pattern. Applicants submit that the O'Hagan '513 patent discloses a cross hair aiming pattern, however, there is no teaching as to how that aiming pattern is generated. Furthermore, the O'Hagan '513 patent does not disclose or suggest a diffuser of any kind. Thus, the one reference cited by the Examiner does not teach or suggest the recited limitation of the rejected claim. For at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 56 depends from claim 55 and recites the further limitation that the image module further includes means adapting said diffuser plate to be snap-fit onto the frame. As noted above, the O'Hagan '513 patent does not teach or suggest a diffuser plate, nor has the Examiner used official notice to provide prior art including the recited limitations of claim 18. Therefore, for at least these reasons, the Examiner has failed to establish a case of prima facie obviousness.

Claim 57 depends from claim 55 and recites the further limitation of a frame, means adapting the diffuser plate to be snap-fit onto the frame and means adapting the aperture plate to be biased toward the back plate. As noted above, the O'Hagan '513

patent does not disclose either an aperture plate or a diffuser plate. Because the cited art does not disclose or suggest an element of the claimed invention, the Examiner has failed to establish a prima facie case of obviousness.

Claim 66

The Examiner's rejection of claim 66 under 35 U.S.C. §103(a) as being unpatentable over O'Hagan et al., in view of well known prior art should be withdrawn.

Claim 66 recites an imaging module comprising: a frame having sidewalls, a circuit board mounted to the frame, an image sensor carried by the circuit board, at least one light source for illuminating at least part of a target area, a planar optical member carrying at least one optical component, and resilient fingers formed in said sidewalls for receiving and securing said planar optical member in a stationary position in said frame.

The Examiner uses the same blanket rejection for independent claim 66 as was used in rejecting claim 1, even though claim 66 recites different limitations. The O'Hagan '513 patent does not disclose or suggest a planar optical member, nor does the Examiner take official notice of teachings to modify the disclosure of the O'Hagan '513 patent to incorporate a planar optical member. Thus, at least one recited limitation of the claimed invention is missing from the art provided by the Examiner. To establish a prima facie case of obviousness, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981 (CCPA 1974). Therefore, the Examiner has failed to establish a prima facie case of obviousness.

Claim 67

Claim 67 depends from claim 66 and is believed to be allowable for at least the reason that they depend from an allowable base claim. Furthermore, Applicants submit that claims 67 is allowable for reasons in addition to its dependency from an allowable base claim. The additional reasons for the allowability of claim 67 will now be discussed.

Claim 67 cites the additional limitation that the optical member delimits a front side of the module and the circuit board delimits the rear side of the module. The O'Hagan '513 patent does not disclose or suggest an imaging module in having a circuit board delimiting a rear side and a planar optical element delimiting a front side. Therefore, the Examiner has failed to establish a prima facie case of obviousness.

Claim 68

Claim 68 recites the limitation of an imaging module including a one-piece frame including a lens assembly retainer section and top and side sidewalls delimiting an area. Claim 68 further recites the limitation of a circuit board, an imaging assembly having a sensor carried by the circuit board and a lens assembly disposed in the retainer section, and at least one light source for illuminating at least part of a target area. The O'Hagan '513 patent does not disclose or suggest a one-piece frame assembly including a lens assembly retainer section and top and side sidewalls. Nor does the Examiner provide an explanation as to why a skilled artisan would be motivated to modify the teachings of the O'Hagan '513 patent to arrive at the claimed invention. Therefore, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 69-71

Claims 69-71 are believed to be allowable for at least the reason that they depend from an allowable base claim. Furthermore, Applicants submit that claims 69-71 are allowable for reasons in addition to their dependency from an allowable base claim. The additional reasons for the allowability of claims 69-71 will now be discussed.

Claim 69 depends from claim 68 and recites the further limitation that the at least one light source is carried by the circuit board. The O'Hagan '513 patent does not disclose a light source carried on the same circuit board as the image sensor. Furthermore, as noted above, the Examiner has failed to provide an explanation as to why a skill artisan would be motivated to combine an illumination light source and the image sensor on a single circuit board when no suggestion to do so is contained

within the lone reference cited by the Examiner. Therefore, the Examiner has failed to establish a prima facie case of obviousness.

Claim 72

Claim 72 recites a imaging module including a circuit board, and image sensor, an aiming light source and an opaque dome disposed over the aiming light source, the opaque dome having an aperture. The O'Hagan '513 patent does not disclose or suggest disposing an opaque dome having an aperture over the light source, nor has the Examiner established that an opaque dome with an aperture is of common knowledge in the art. Furthermore, the Examiner has failed to provide any support as to why a skilled artisan would be motivated to modify the structure of the O'Hagan '513 patent to that of the claimed invention. Therefore, for at least this reason, the Examiner has failed to establish a prima facie case of obviousness.

Claim 73-74

Claims 73 and 74 are believed to be allowable for at least the reason that they depend from an allowable base claim. Furthermore, Applicants submit that claims 73 and 74 are allowable for reasons in addition to their dependency from an allowable base claim. The additional reasons for the allowability of claims 73 and 74 will now be discussed.

Claims 73 and 74

Claim 73 depends from claim 72 and recites the further limitation that the image sensor and the aiming light source are carried by the circuit board. The O'Hagan '513 patent does not disclose a light source carried on the same circuit board as the image sensor. Furthermore, as noted above, the Examiner has failed to provide an explanation as to why a skill artisan would be motivated to combine an illumination light source and the image sensor on a single circuit board when no suggestion to do so is contained within the lone reference cited by the Examiner. Therefore, the Examiner has failed to establish a prima facie case of obviousness.

IX. CONCLUSION

In conclusion, Applicants requests a reversal of each of the grounds of rejection maintained by the Examiner.

If there are any other fees due in connection with the filing of this Brief on Appeal, please charge the fees to our Deposit Account No. 50-0289. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,
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Appendix

1. An imaging module comprising:
 - a circuit board;
 - an image sensor carried by said circuit board; and
 - at least one light source for illuminating at least part of a target area, wherein
said at least one light source is mounted to said circuit board, whereby
said circuit board carries both of said image sensor and said at least
one light source.
3. The imaging module of claim 1, wherein said at least one light source includes an
aiming light source and an illumination light source and wherein said at least one
illumination light source and said at least one aiming light source are each mounted to
said circuit board, whereby said circuit board carries each of said image sensor, said at
least one illumination light source and said at least one aiming light source.
4. The imaging module of claim 1, further comprising a frame and at least one planar
optical component and wherein said frame comprises sidewalls having resilient
fingers formed therein for receiving and securing said optical component in said
frame in a stationary position in said frame without use of adhesives or any additional
mechanical securing apparatuses or agents.
5. The imaging module of claim 1, wherein said circuit board carries essentially all
image sensor signal processing circuitry, image capture circuitry, and decoding and or
recognizing circuitry of an optical reader in which said module is to be installed.
6. The imaging module of claim 1, wherein said image sensor is a 2D image sensor,
wherein said at least one light source is a plurality of aiming light sources, and

wherein said module includes optics associated with said plurality of aiming light sources for projecting a solitary horizontal line aiming pattern in a target area.

7. The imaging module of claim 1, wherein said imaging module further includes a frame, wherein said frame is a one-piece unit defining top, bottom and side sidewalls of said module, and wherein said sidewalls and said circuit board define a cubic rectangular configuration.

8. The imaging module of claim 7, wherein said imaging module further comprises a lens assembly and wherein said frame is a one-piece unit further comprising a retainer section retaining said lens assembly.

9. The imaging module of claim 7, wherein said top and side sidewalls of said one-piece frame define a partially enclosed contained area, and wherein said at least one light source and said image sensor are disposed inside said contained area, whereby said at least one light source and said image sensor are structurally protected by said frame.

10. The imaging module of claim 1, wherein said imaging module further includes a frame, wherein said frame includes top and side sidewalls, and wherein a combination of said circuit board and said top and side sidewalls defines a partially enclosed contained area and delimits an exterior of said module, and wherein said at least one light source is disposed inside said contained area, whereby said at least one light source is structurally protected by a combination of said circuit board and said frame.

11. The imaging module of claim 1, wherein said imaging module further includes a frame, wherein said frame includes top and side sidewalls and wherein a combination of said circuit board and said top and side sidewalls defines a

partially enclosed contained area and delimits an exterior of said module, and wherein said at least one light source and said image sensor are disposed inside said contained area, whereby said at least one light source and said image sensor are structurally protected by a combination of said circuit board and said frame.

12. The imaging module of claim 10, wherein essentially an entirety of light sources of said module are incorporated in said contained area.

13. The imaging module of claim 1, further including a frame, wherein said frame includes a back plate having a center recess for receiving and aligning said image sensor.

14. The imaging module of claim 1, further including a frame, wherein said frame includes a back plate having a center recess for receiving and aligning said image sensor and at least one side recess for accommodating electrical components emanating forwardly of said circuit board.

15. The imaging module of claim 1, wherein said at least one light source comprises a pair of aiming light sources, and wherein said module further comprises an aperture plate having a pair of apertured domes disposed over said light sources for shaping light emanating from said aiming light sources.

16. The imaging module of claim 1, further including a frame, wherein said frame includes a back plate, and wherein said at least one light source further includes illumination and aiming LEDs having leads extending through said back plate and being electrically connected to said circuit board.

17. The imaging module of claim 1, wherein said at least one light source further includes illumination and aiming LEDs being electrically connected to said circuit board, and wherein said module further comprises:

an aperture plate including domes having slit apertures for shaping light emanating from said aiming LEDs being fit over said aiming LEDs;
and
a diffuser plate including optics for diffusing light emanating from said illumination LEDs being positioned in said optical reader forward of said aperture plate.

18. The imaging module of claim 17, further including means adapting said diffuser plate to be snap-fit onto said frame.

19. The imaging module of claim 17, further comprising:

means adapting said diffuser plate to be snap-fit onto said frame; and
means adapting said aperture plate to be biased toward said back plate when said diffuser plate is snap-fit onto said frame.

39. An optical reader for reading indicia, said optical reader comprising:

a housing; and
an imaging module disposed in said housing, said imaging module including:
a circuit board;
an image sensor carried by said circuit board; and
at least one light source for illuminating at least part of a target area outside of said housing wherein said at least one light source is mounted to said circuit board, whereby said circuit board carries both of said image sensor and said at least one light source.

41. The optical reader of claim 39, wherein said at least one light source includes at least one illumination light source and at least one aiming light source, and wherein said at least one illumination light source and said at least one aiming light source are each mounted to said circuit board, whereby said circuit board carries each of said image sensor, said at least one illumination light source and said at least one aiming light source.

42. The optical reader of claim 39, further comprising a frame and at least one planar optical component, wherein said frame comprises sidewalls having resilient fingers formed therein for receiving and securing said optical component in said frame in a stationary position in said frame without use of adhesives or any additional mechanical securing apparatuses or agents.

43. The optical reader of claim 39, wherein said circuit board carries essentially all image sensor signal processing circuitry, image capture circuitry, and decoding and or recognizing circuitry of an optical reader in which said module is to be installed.

44. The optical reader of claim 39, wherein said image sensor is a 2D image sensor, wherein said at least one light source is a plurality of aiming light sources and wherein said module includes optics associated with said plurality of aiming light source for projecting a solitary horizontal line aiming pattern in a target area.

45. The optical reader of claim 39, further comprising a frame, wherein said frame is a one-piece unit defining top bottom and side sidewalls of said module, and wherein said sidewalls and said circuit board define a cubic rectangular configuration.

46. The optical reader of claim 45, further comprising a frame, wherein said imaging module further comprises a lens assembly and wherein said frame is a one-piece unit further comprising a retainer section retaining said lens assembly.

47. The optical reader of claim 45, further comprising a frame, wherein said top and side sidewalls of said one-piece frame define a partially enclosed contained area, and wherein said at least one illumination source and said image sensor are disposed inside said contained area, whereby said at least one illumination source and said image sensor are structurally protected by said frame.

48. The optical reader of claim 39, further comprising a frame, wherein said frame includes top and side sidewalls, and wherein a combination of said circuit board and said top and side sidewalls defines a partially enclosed contained area and delimits an exterior of said module, and wherein said at least one illumination source is disposed inside said contained area, whereby said at least one illumination source is structurally protected by a combination of said circuit board and said frame.

49. The optical reader of claim 39, further comprising a frame, wherein said frame includes top and side sidewalls and wherein a combination of said circuit board and said top and side sidewalls defines a partially enclosed contained area and delimits an exterior of said module, and wherein said at least one source and said image sensor are disposed inside said contained area, whereby said at least one illumination source and said image sensor are structurally protected by a combination of said circuit board and said frame.

50. The optical reader of claim 48, wherein essentially an entirety of illumination sources of said module are incorporated in said contained area.

51. The optical reader of claim 39, further comprising a frame, wherein said frame includes a back plate having a center recess for receiving and aligning said image sensor.

52. The optical reader of claim 39, further comprising a frame, wherein said frame includes a back plate having a center recess for receiving and aligning said image sensor and at least one side recess for accommodating electrical components extending forwardly of said circuit board.

53. The optical reader of claim 39, further including a pair of aiming light sources, and an aperture plate having a pair of apertured domes disposed over said light sources for shaping light emanating from said aiming light sources.

54. The optical reader of claim 39, further comprising a frame, wherein said frame includes a back plate, and wherein said at least one illumination source further includes illumination and aiming LEDs having leads extending through said back plate and being electrically connected to said circuit board.

55. The optical reader of claim 39, wherein said at least one illumination source further includes illumination and aiming LEDs being electrically connected to said circuit board, and wherein said module further comprises:

an aperture plate including domes having slit apertures for shaping light emanating from said aiming LEDs being fit over said aiming LEDs; and

a diffuser plate including optics for diffusing light emanating from said illumination LEDs being positioned in said optical reader forward of said aperture plate.

56. The optical reader of claim 55, further comprising a frame and further including means adapting said diffuser plate to be snap-fit onto said frame.

57. The optical reader of claim 55, further comprising:

a frame;

means adapting said diffuser plate to be snap-fit onto said frame; and

means adapting said aperture plate to be biased toward said back plate when said diffuser plate is snap-fit onto said frame.

58. The imaging module of claim 1, wherein said at least one light source is an illumination light source.

59. The imaging module of claim 58, wherein said at least one light source is a plurality of illumination light sources.

60. The imaging module of claim 1, wherein said at least one light sources is an aiming light source.

61. The imaging module of claim 1, wherein said at least one light source is a plurality of aiming light sources.

62. The optical reader of claim 39, wherein said at least one light source is an illumination light source.

63. The optical reader of claim 39, wherein said at least one light source is a plurality of illumination light sources.

64. The optical reader of claim 39, wherein said at least one light source is an aiming light source.

65. The optical reader of claim 39, wherein said at least one light source is a plurality of aiming light source.

66. An imaging module comprising:

- a frame having sidewalls;
- a circuit board mounted to said frame;
- an image sensor carried by said circuit board;
- at least one light source for illuminating at least part of a target area;
- a planar optical member carrying at least one optical component; and
- resilient fingers formed in said sidewalls for receiving and securing said planar optical member in a stationary position in said frame.

67. The module of claim 66, wherein said planar optical member delimits a front side of said module, and wherein said circuit board delimits a rear side of said module.

67. The module of claim 66, wherein said planar optical member delimits a front side of said module, and wherein said circuit board delimits a rear side of said module.

68. An imaging module comprising:

- a one-piece frame including a lens assembly retainer section and top and side sidewalls delimiting an area;
- a circuit board;
- an imaging assembly including a sensor carried by said circuit board; and a lens assembly disposed in said retainer section; and
- at least one light source for illuminating at least part of a target area.

69. The imaging module of claim 68, wherein said at least one light source is carried by said circuit board.

70. The imaging module of claim 69, wherein said at least one light source is an illumination light source.
71. The imaging module of claim 69, wherein said at least one light source is an aiming light source.
72. An imaging module comprising:
- a circuit board;
 - an image sensor;
 - an aiming light source for projecting at least part of an aiming pattern on a target area; and
 - an opaque dome disposed over said aiming light source, said opaque dome having an aperture.
73. The imaging module of 72, wherein said image sensor and said aiming light source are disposed on said circuit board.
74. The imaging module of claim 73, wherein said imaging module further includes an illumination light source disposed on said circuit board.
75. The imaging module of claim 1, wherein said at least one light source is an LED.
76. The imaging module of claim 1, wherein said at least one light source is a leaded LED.
77. The imaging module of claim 1, wherein said at least one light source is a leaded LED having leads extending through said common circuit board.
78. The imaging module of claim 1, further comprising a frame comprising a retainer for receiving a lens assembly.

79. The reader of claim 39, wherein said at least one light source is an LED.
80. The reader of claim 39, wherein said at least one light source is a leaded LED.
81. The reader of claim 39, wherein said at least one light source is a leaded LED having leads extending through said common circuit board.
82. The reader of claim 39, further comprising a frame including a retainer for receiving a lens assembly.

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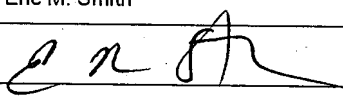
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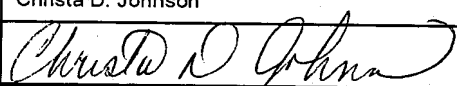
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